

respectfully disagree with the Examiner. Most notably, the cited portion of Behrends (column 8, lines 4-11) does not describe draining AMD liquid through a bed of river gravel and limestone, as the Examiner contends. Indeed, Behrends never teaches specifically employing a mixture of substrates. The cited portion of Behrends is reproduced below for a more focused analysis of what it discloses:

[d]uring the drain cycle, atmospheric oxygen is rapidly supplied to the de-watered and relatively thin (from about 1 micron to about 2 mm thick) microbial biofilms residing on backfill substrate, i.e., river gravel and/or limestone, and/or any other appropriate substrate, thus promoting growth of aerobic bacteria which are responsible for oxidizing ammonia (nitrification), various heavy metals, and other toxic compounds.

Behrends '433, at column 8, lines 4-12 (emphasis added). Clearly, Behrends speaks of biofilms residing on backfill substrate (singular), not substrates (plural), and speaks of river gravel and/or limestone and/or any other appropriate substrate (singular) only as examples of a potential singular substrate. The Examiner, in an attempt to anticipate the claims of the present application, has liberally interpreted this language to conclusively teach the use of river gravel and limestone together to treat acidic mine drainage. There is nothing in Behrends to lead one to such a conclusion, especially given the generic nature of the disclosure of "river gravel" and "limestone" and "any other appropriate substrate" as evidenced by their listing coming after "i.e.," which means "that is to say." It is incontrovertible that Behrends does not teach, as does the present application, that using two specific materials together can result in improved precipitation of metals from solution. Rather, as is clear from the "and/or" terminology, Behrends simply requires that some substrate (singular) be present for his process. Additionally, the "and/or" terminology leads one to the conclusion that according to Behrends, it does not matter what substrate is used, so long as some substrate (singular) is present. The present invention shows and claims that it does matter what substrates (plural) are employed and, thus, the prior art does not anticipate the present invention.

Claim 1 is not anticipated by Behrends, and reconsideration of the anticipation rejection with respect to claims 1-4, 6-9 and 11 is respectfully requested.

The Examiner has rejected claims 1-6 as obvious over Burke '173, Budiet

'562, and Stafford '276. According to the Examiner, Burke describes placing limestone-containing blocks in a natural stream or at the inlet of a lake to ameliorate the deleterious effects of acidic mine drainage. The Examiner turns to Budiet as evidence that skilled artisans would recognize that a technical solution effective in ameliorating acid rain-receiving streams and lakes would also work towards ameliorating the problem of acidic mine drainage, and concludes that it would have been obvious to have placed Burke's limestone bearing blocks downstream from a point at which acid mine drainage enters a natural stream or lake. The Examiner then turns to a patent directed towards an anchor in order to show that gravel and shale may be found in some lakes. Combining all of these references the Examiner asserts that it would have been obvious to have placed a block in an acid mine drainage receiving stream or lake, including lakes bearing gravel or shale at the bottom thereof. Thus, with such a combination, gravel, shale, and limestone could be found in an acid mine drainage receiving stream or lake, thus meeting the limitations of claims 1-5. Regarding claim 6, the Examiner feels that Burke and Stafford satisfy the limitation of "large blocks" in their discussion of limestone, shale, and gravel.

Applicants respectfully disagree that the above combination renders present claims 1-6 obvious. Applicants recognize that lake bottoms may be composed of a wide variety of lithic materials, including gravel or shale. Applicants also recognize that limestone blocks may be placed in natural streams or at the inlets to lakes to ameliorate AMD. However, none of the prior patents teaches or suggests the unexpected results that will be obtained by designing a system that purposefully juxtaposes the materials as currently claimed. As indicated in Applicants' experimental section, the juxtaposition of a lithic neutralizing agent and a lithic precipitating agent leads to a degree of metal removal that is not expected based upon metal removal in the presence of each material separately. For example, Applicants here quote their application at page 10, lines 11-18:

A control batch which had no samples in it showed less than 1% removal of Fe. Table 4 shows that the mix of both Tuscarora and Columbus materials resulted in greater iron removal (50.5%) than Columbus alone (32.6%) under nearly identical pH conditions. This was not expected based on iron removal in the presence of each material separately. This confirms a synergistic effect related to individual material properties. These results are in agreement with both the observations made in the

Obey River, and the experimental Silver Creek location, and clearly point to the lithic surface controlled removal of metals.

Indeed, if the present invention were obvious, it would have been put into practice in many of the thousands of treatment facilities in the United States and throughout the world. Additionally, such an easy-to-employ improvement would, by now, be published and well known in the art in light of the long felt need for systems for removing metals from aqueous solutions. Clearly, such a juxtaposition of a neutralizing agent and precipitating agent is unknown in the art, as evidenced by the fact that the Examiner was unable to locate any reference teaching such a juxtaposition, and had to rely upon a questionable interpretation of an unenlightening and generic "and/or" disclosure found at one single line of Behrends '433.

Regarding the Examiner's rejection of claims 1-5 and 7 as obvious over Burke, Budiet, Stafford, and Weihe or Watton, Applicants note that the addition of Weihe or Watton does not overcome the shortcomings of the combination of Burke, Butie, and Stafford, as argued above, and, thus, this 103 rejection fails for relying upon Burke, Budiet, and Stafford.

The Examiner has rejected claims 8-11 as obvious over Watton in view of Chapman. According to the Examiner, Watton describes treating AMD pumps into a packed bed of limestone particles followed ultimately by discharge to a natural stream or other body of water. The Examiner relies on Chapman for the recognition that natural stones, rocks, etc. may be found in streambeds and may collect precipitated metals emanating from acidic mine drainage. Notably, the Examiner makes no indication as to how Watton and Chapman teach passing the aqueous solution through a pipe that includes both the at least one neutralizing agent and the at least one precipitating agent, as required by claim 8. Rather, assuming that Watton describes treating aqueous solutions by passing them through a limestone bed and thereafter discharging them to a natural stream, it is hard to see how combining Chapman's teaching that streams may include rocks and stones helps to obviate a claim that requires a pipe to include at least one neutralizing agent and at least one precipitating agent. In the combination suggested by the Examiner, at most the pipe would contain limestone, as taught in Watton, and the

stones and rocks, as taught in Chapman would be external of the pipe, i.e., contacted after being discharged from the pipe. Such a combination does not meet the claims, and reconsideration is respectfully requested.

Additionally, as stated above, it is appreciated that metals, along with other materials, may precipitate on any natural substrate available. However, none of the cited references describe or foresee the specific juxtaposition that is currently claimed. The present claims involve the specific mixing of at least one lithic neutralizing agent with at least one lithic precipitating agent for the purposes of protecting the neutralizing agent from being coated by the materials being precipitated. This provides an advancement to aqueous treatment systems that is neither anticipated nor obvious in light of the prior knowledge in the art.

Thus, a Notice of Allowance for all pending claims is earnestly solicited. Should the Examiner wish to discuss any of the foregoing in greater detail, the undersigned would welcome a telephone call.

In the event a fee is required with the filing of this Amendment and the required fee is not enclosed or is deemed insufficient, the Assistant Commissioner of Patents and Trademarks is hereby authorized to withdraw the required funds from Deposit Account No. 18-0987. If a withdrawal is required from Deposit Account No. 18-0987, the undersigned attorney respectfully requests that the Assistant Commissioner of Patents and Trademarks cite Attorney Docket Number UA372 for billing purposes.

Respectfully submitted,

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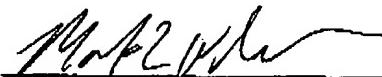
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TELECOMMUNICATION COVER PAGE

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COMMENTS:

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